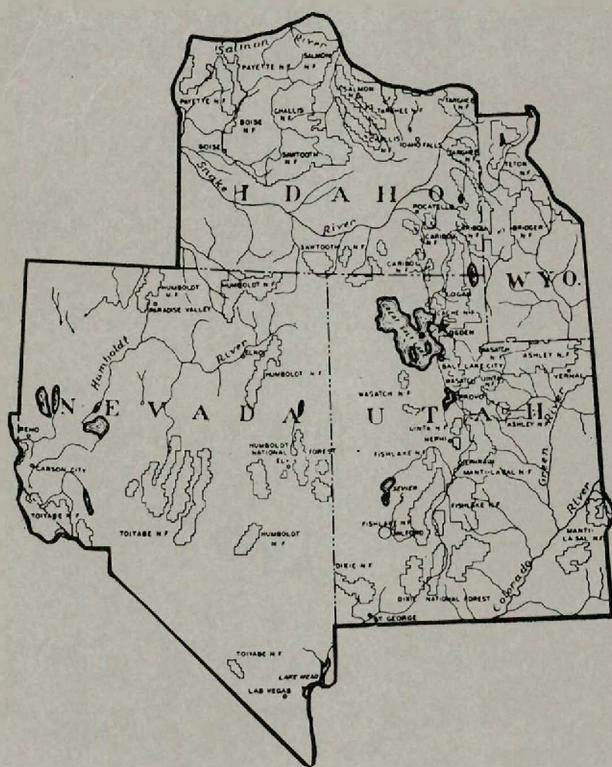


DEFOLIATOR INFESTATIONS
(OTHER THAN SPRUCE BUDWORM)

FOREST SERVICE REGION 4

November 1964



DIVISION OF TIMBER MANAGEMENT

Forest Service
U. S. Department of Agriculture
Ogden, Utah

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INTRODUCTION

A great variety of defoliating insects occur throughout the territory included in U. S. Forest Service, Region Four. Within the last few years, most forest lands have come under a more intensive resource management program. Consequently, many of the defoliating pests that were practically ignored in the past, are now considered in a more serious light since their hosts have increased in value.

Some of the defoliator infestations discussed in this report are new, others are old, having been epidemic for fifteen years or more. The effect of defoliators in commercial forest areas is primarily an impact on growth although in some cases tree mortality occurs. Defoliators in recreational areas adversely affect the aesthetics and in picnic and camping areas often destroy the only available shade. Trees to be used for Christmas trees are rendered unfit for sale by defoliation. Extensive defoliation of browse species may affect big game populations. Other resource values can also be adversely affected by epidemics of defoliating insects.

It is the purpose of this report to present the entomological interpretations of the more serious defoliating infestations, other than the spruce budworm, occurring on forest and range lands of all ownerships in the states of Utah, Nevada, the western half of Wyoming, and the southern two-thirds of Idaho.

This report is divided into three sections. The first section covers defoliating insects affecting deciduous trees and shrubs, the second, those infesting mountain conifers and the third, outbreaks in pinyon-juniper type. A regional map showing relative locations of the various outbreaks is appended.

SECTION I

INSECTS AFFECTING DECIDUOUS TREE AND SHRUBS

(Insects discussed in this section)

Aspen Leaf Tier
Tent Caterpillars
Sheep Moth
Tussock Moth
Anacamptodes clivinaria (Guenee)

Aspen Leaf Tier

Damaging populations of the aspen leaf tier Sciaphila duplex (Wlsh.) have been present in some aspen stands in Region Four since 1962. Infestations of the large aspen tortrix, Choristoneura conflictana (Wlk.) have also increased to damaging proportions in all areas presently infested with the aspen leaf tier. The total infested acres decreased from over 300,000 in 1962, to about 150,000 in 1963. This year approximately 170,000 acres are infested with a majority of the infestation occurring on the Dixie and Fishlake National Forests in southern Utah. Acreage and intensity of damage decreased noticeably on the Cache National Forest in northern Utah. With one exception the size of area infested and defoliation increased in all infestations on the Dixie and Fishlake National Forests.

On the Fishlake National Forest defoliation in all infestations was more severe and widespread than occurred in 1963. The acreage infested has increased in Sheep Valley and UM Creek on the Fishlake National Forest since last year, and now compares in size with the 1962 infestation. Defoliation this year ranged from 30 to 95 percent and averaged around 85 percent. Heavy moth flights occurred in late July and adults were observed depositing eggs on aspen trunks. Few egg masses were found on aspen leaves. Approximately eight percent of the leaf tier larvae were parasitized by wasps. About five percent of the pupae were parasitized by species of Diptera. This year parasitism is less than half of that which occurred in 1962. We do not believe parasitism in these two areas is sufficient to cause a sizeable reduction in the 1965 leaf tier population.

About 6,000 acres are infested with the aspen leaf tier and the large aspen tortrix in Big John's Flat, Fishlake National Forest, where defoliation averages about 75 to 80 percent. Larval and pupal parasitism was found to have increased since 1962, with approximately 39.5 percent of the larvae parasitized by Hymenoptera. Dipterous parasites occupied 11.5 percent of the defoliator pupae. It is possible here, that parasites could increase to exert a controlling influence on leaf tier and large aspen tortrix populations within the next couple of years.

In the Beaver Canyon Drainages the aspen leaf tier and the large aspen tortrix infested acreage has more than doubled since 1962 to approximately 8,000 acres. This year defoliation averaged 85 percent. The insects are moving over the ridge to the south, and the number of acres infested will probably increase again next year.

In summary, the leaf tier-tortrix populations have increased on the Fishlake National Forest over last year, and are expected to maintain their present epidemic trend or to increase in some areas at least through next year.

On the Dixie National Forest the aspen leaf tier-tortrix infestations in the Red Desert near Duck Creek Ranger Station north through Horse Valley this year were found to cover approximately 50,000 acres. Two new areas of aspen defoliation were located, one in the vicinity of Jones Corral north to Table Mountain, and the other in the head of Poison Creek on the Aquarius Plateau.

Defoliation was less than 20 percent in the Red Desert infestation, with large aspen tortrix comprising about 70 percent of the leaf tier-tortrix population. Hymenopterous species parasitized about 16 percent of the leaf tier-tortrix larvae. Pupal parasitism by Dipterous parasites averaged three percent. From all indications the trend in this area will continue downward through next year.

In 1963, leaf tier-tortrix infestations almost died out in Horse Valley. This year, however, numerous moths were observed in flight and depositing egg masses on aspen trunks. Natural mortality of larvae and pupae was higher in Horse Valley than in any other infestation, with approximately 48.5 percent of the leaf tier-tortrix larvae and about one percent of the pupae parasitized. If parasites continue to increase, they may exert a controlling influence in the host population next year; however, too little is known of the influence of parasites on these pest insects to make a reliable prediction.

Between Jones Corral and Table Mountain to the north, aspen defoliation averaged 25 to 50 percent on an estimated 15 to 20 thousand acres. However, some small groups of trees were more than 80 percent defoliated.

Approximately 6,000 acres of new and apparently aggressive infestations of the large aspen tortrix were found in Poison Creek on the Aquarius Plateau during 1964. Defoliation ranged from 5 to nearly 100 percent with an overall average of 20 percent. On about 12 acres defoliation exceeded 90 percent. At the time the evaluation was made, 85 percent of the moths had emerged and were depositing eggs on aspen trunks and leaves. Parasitism by Diptera and Hymenoptera was very low. Acreage and intensity of damage is expected to increase through 1965.

Tent Caterpillars

The Great Basin tent caterpillar, Malacosoma fragile (Stretch), has been epidemic for the last three years along the Virgin River and in other localized areas in southern Utah. In 1964 nearly all the infested aspen, cottonwoods, and several species of herbaceous plants were completely defoliated. The infestation on cottonwood trees in the canyon bottoms of Zion National Park was particularly aggressive. On many trees more than 200 tents were formed by the caterpillar colonies.

A control program using Bacillus thuringiensis Berliner was successful in reducing the tent caterpillar population in Bryce Canyon National Park where bitterbrush was the preferred host.

Widespread localized outbreaks of this insect also occurred in western Wyoming and eastern Idaho. Damaging conditions are expected again in 1965.

Sheep Day Moth

The sheep day moth, Pseudohazis sp., has been observed defoliating herbaceous plants throughout the Region for the last three years. In the past damage has usually been light, however, most reports received this year show that the caterpillars caused severe defoliation in many areas. Heavy concentrations of the larvae were observed defoliating snowberry near Thistle Junction, Utah, on the Manti-LaSal National Forest and throughout many areas of the Cache National Forest in southwestern Idaho and northern Utah. Light defoliation of snowberry was observed in the Crow Creek Drainage of the Caribou National Forest in southeastern Idaho.

Continued defoliation of herbaceous plants throughout the infested area is expected at least through next year.

Tussock Moth

Heavy populations of tussock moths, Hemerocampa vetusta (Bdv.) on bitterbrush, Purshia tridentata, occurred in 1964 near the Mt. Rose Highway south of Reno, Nevada. This area was used in 1959 for a field application test of a polyhedral virus.

The present infestation began to build two years ago. Last year it was predicted that in 1964 the population should reach its peak. The late June examinations showed a population of second to fourth instar larvae averaging 13.3 per 15-inch twig over the entire infestation. Larval populations within and immediately adjoining the original spray plots averaged 14.7 per 15-inch twig and ranged from 3 to 28. Of this total, slightly more than 35 percent were dead. The dead larvae appeared to be typical virus kills.

To determine if there was a difference in larval mortality near the virus test area and away from it, samples were taken at a distance of approximately $1\frac{1}{2}$ miles from the spray plots. The area between the sampling locations was nonhost type interspersed with small patches of type infested to a lesser degree than the two areas sampled.

The stage of larval development in the check area appeared to be the same as in the test area. Larval populations averaged 12.6 per 15-inch twig and ranged from 3 to 27. Only one dead larva was found and it did not appear to have been killed by the virus, but nevertheless, it was counted and a larval mortality of .8 percent calculated.

The data seem to indicate rather strongly that the virus not only reduced the 1959 population but persisted in the area and is once again exerting a controlling influence. This is, of course, a recognized feature of insect viruses but to our knowledge, it is the only verification of the phenomenon that has occurred in Region Four.

Studies conducted in 1959 showed a majority of the infected larvae to have died in the fifth and sixth instars. Therefore, larval mortality in and around the test area probably exceeded the 35 percent recorded. It was unfortunate not to have been able to observe the total effect of the virus.

At the time of the observations, the effect of the virus appeared to be uniformly noticeable south and east about 10 chains to the edge of type. The test plots were near the north edge of the bitterbrush type, consequently, the spread to the north was limited to a distance of 2 to 5 chains.

The present infestation contains a population density equal to or slightly exceeding that of 1959, however, it covers at least twice as much area as was infested in 1959.

Defoliation of bitterbrush is expected to continue at a high level through next year in all areas except in the immediate vicinity of the virus spray plots. In addition, the infestation will probably increase areawise.

In 1959, approximately 50 square miles of brush species surrounding the Boise Basin Experimental Station and the Town Creek Plantation near Idaho City, Idaho, on the Boise National Forest were infested with tussock moths. The infestation within this area was so intense that upon complete defoliation of the brush, the larvae began defoliating the young ponderosa pine plantings. The occurrence of a native polyhedral virus during this first year failed to prevent reinestation in 1960. The outbreak persisted through 1961. During 1962, egg parasites and a native virus practically eliminated the entire tussock moth population. Only small widely scattered populations have been reported since 1961. This year, Boise National Forest personnel reported that tussock moths again were causing moderate to severe defoliation of Ceanothus sp. on the Town Creek Plantation. Biological examination of the infested area showed an average of 5 egg masses per bush.

There was also evidence that native virus had killed some larvae throughout the infested area.

At present there are sufficient numbers of tussock moth egg masses to provide relatively heavy larval populations next spring. Consequently, defoliation of brush is expected to be severe through next year. It is quite possible that the native virus and a buildup of egg parasites will again reduce the infestation level before the tussock moths move in damaging numbers to the young planted ponderosa pine.

Anacamptodes clivinaria (Guenee)

In 1962 mountain mahogany stands on Juniper Mountain, Owyhee County, Idaho, were severely defoliated by larvae of a geometrid Anacamptodes clivinaria (Guenee). Heavy defoliation continued in 1963 with limb and whole tree mortality occurring on about 20 acres in the center of the infested area. In addition there are many dead trees scattered throughout the infested area that apparently have been killed by this insect.

The insect population reached a peak in 1962 and has dropped off each year since then. The average pupal density for the last three years showed the following downward trend: 1962 - 29.8 pupae; 1963 - 12.8 pupae; and 1964 - 6.2 pupae per square foot of soil. We feel that the decrease in pupal density is caused partially by larval dispersal resulting from lack of food in the main infestation. This is supported by the fact that more pupae occur in areas of light to medium defoliation than found in heavily defoliated areas. Nevertheless, there has been a general decline in the population level. Larval and pupal population counts this year were considerably lower than in 1963. No one specific factor can have caused the reduction in population. Heavy rain and hailstorms occurred in the Juniper Mountain area during the emergence and oviposition period of the Anacamptodes and early June examinations showed that literally thousands of dead moths were beat to the ground. This factor could have severely reduced the number of moths making the 1964 populations much lower than last year.

In summary, the populations presently are at a lower level than in 1963. However, there is still potential for a damaging population of this pest in 1965.

Sagebrush Defoliator

Infestations of the sagebrush defoliator, Aroga websteri (Clarke) were again actively defoliating sagebrush Artemisia tridentata in southern Idaho and central Utah during 1964.

The following parasites have been reared from A. websteri.

Family Encyrtidae - Copidosoma deceptor, Miller

Family Chalcididae - Spilochalcis leptis, Burks

Family Ichneumonidae - Phaeogenes sp.

It is not known what influence these parasites may exert in the future on the sagebrush defoliator populations.

Defoliation of sagebrush, however, is expected to continue through next year in all areas now infested.

SECTION II

INSECTS AFFECTING MOUNTAIN CONIFERS

(Insects discussed in this section)

Lodgepole Needle Miner
Tube Moth
Douglas-fir Tussock Moth
Mealybugs, Puto, sp.
Black-headed Budworm
White Fir Needle Miner
Mites

Lodgepole Needle Miner

Populations of the lodgepole needle miner, Recurvaria milleri Busck., have been recorded in the lodgepole pine stands of the Intermountain Region for over 25 years. Intensity of defoliation has varied yearly. Generally, needle miner populations have built up to epidemic levels and then after 4 to 10 years have been reduced by natural factors to small static infestations. Accumulated damage to date has not been severe and tree mortality that can be credited solely to this insect has not been observed in Region Four.

The needle miner infestations on the Targhee National Forest in eastern Idaho and the Ashley National Forest in eastern Utah have shown a declining tendency for the last two years.

Several small localized needle miner infestations are still active in the lodgepole pine stands near Island Park, Idaho, on the Targhee National Forest. These small infestation centers have persisted for about three years around Island Park and Sheridan Reservoirs in eastern Idaho, but total defoliation and acreage infested decreased this year. The Targhee National Forest infestation is a complex of the lodgepole needle miner, three budworms, Choristoneura pinus Freeman, C. lambertiana (Busck), a Dioryctria, and the pine tube moth or needle tier Argyrotaenia pinatubana Kearnf. An additional decrease in the size of the infested area is expected next year.

Examination of the infestation on the Ashley National Forest southwest of Flaming Gorge Recreation area near Greendale Junction, Utah, shows the needle miner populations at a relatively low ebb, and damage is expected to be very light next year.

In 1964 an outbreak of lodgepole needle miner infesting ponderosa pine was reported in Hull Creek in the North Fork of the Salmon River on the Salmon National Forest in Idaho. Examination showed that all trees, except very small reproduction, were heavily infested on approximately 75 acres. Many pupae of an unidentified parasite were found within the mined needles. The effect of these parasites in the needle miner populations needs to be determined. However, the infestation is expected to continue at least through next year.

Tube Moth and Associated Terminal Feeders

The pine tube moth known also as the pine needle tier, Argyrotaenia pinatubana Kearnf, and a complex of the jackpine budworm, Choristoneura pinus Freeman; sugar pine tortrix, C. lambertiana (Busck); and the pine needle sheath miner, Zelleria haimbachi Busck, have caused serious defoliation of lodgepole pine in eastern Idaho since 1961.

The outbreak currently extends from the west end of Island Park Reservoir near Pond's Lodge, Idaho, east into Yellowstone National Park and in scattered areas south into the lodgepole pine stands of the Cache National Forest near the Idaho-Utah border. The main center of infestation has remained near the west end of Island Park Reservoir for the past three years. Approximately 300,000 acres are infested in all areas.

Ground examination in the area south and west of Island Park Reservoir estimates this complex of insects to have destroyed 100 percent of the current terminal growth in the upper one-third of the crown of all lodgepole pine within the infestation area. Defoliation of the remaining two-thirds of the crown averaged about 75 percent. Practically every candle on all lodgepole pine in this area received some defoliation. All age classes of trees were defoliated.

The infestation is expected to continue at least through next year at a high level.

Douglas-fir Tussock Moth

Populations of the Douglas-fir tussock moth, Hemerocampa pseudotsugata, McD. infesting Douglas-fir along the North and South Forks of the Boise River, Idaho, appear to be at a low level. In 1963, over 12,500 acres of epidemic populations of this insect were aerially sprayed with a polyhedral virus. Establishment of the virus appears successful.

In addition to the severely defoliated area sprayed with virus, many thousands of acres of light tussock moth populations were found adjacent to the control area. Examination of the infested areas in 1964, showed that tussock moth populations had apparently collapsed. This collapse was attributed to the action of egg parasites and a native polyhedral virus. It is quite possible that the control operations carried on in 1963 were responsible for triggering the latent native virus into action. No new viable egg masses were found.

Aerial observers indicated that the only evidence of current year tussock moth activity in Douglas-fir stands was found in the Queens River Drainage east of the 1963 control area. Douglas-fir on approximately 400 acres were lightly defoliated.

At the present time, tussock moth populations feeding on conifers on the Boise National Forest are at a low level and are expected to remain at that level for at least another year.

The Douglas-fir stands in Owyhee County, Idaho, have had a history of chronic Douglas-fir tussock moth infestations since 1927. The infestations have usually built up in a year or two to a high moth population which causes moderate to heavy defoliation, remain at a high level for a period of about two years then almost completely disappear when a latent native polyhedral virus becomes active. This has been true particularly in the

Douglas-fir stands in the vicinity of Silver City, Idaho, and the South Mountain area southeast of Jordan Valley, Oregon.

Evaluations during fall of 1963 and spring of 1964 showed relatively heavy defoliation of Douglas-fir southwest of War Eagle Mountain in Flint Creek and adjacent drainages near Silver City with little or no activity noted in the South Mountain area. Examination this fall showed that tussock moth populations are again building up in Douglas-fir stands in the South Fork of Boulder Creek, Coyote Creek, and in unnamed drainages along the eastern side of South Mountain. Present defoliation is classed as light to moderate on approximately 3,200 acres. The infestation is following the characteristic tussock moth defoliation pattern, where defoliation was most severe in the upper one-third of the crown and decreased toward the bottom of the crown. Reproduction and pole-sized trees are suffering the most severe damage at present. A mosiac type pattern of heavy defoliation was observed throughout the infested area.

Defoliation of Douglas-fir on South Mountain is expected to increase at an epidemic level next year.

Mealybugs

The spruce mealybug, Puto sp., remains at damaging levels on 60,000 acres of Engelmann spruce stands on the Griffin and Barney Top on the Dixie National Forest and Thousand Lake Mountain on the Fishlake National Forest.

No noticeable increase in size of affected area was observed this year.

Observations on the north end of the Thousand Lake Mountain showed a heavier limb-kill on young Engelmann spruce trees than in recent years. Death of many more small trees could result if feeding continues.

No practical methods of control are known for reducing the mealybug populations in these high altitude spruce stands.

Black-Headed Budworm

During 1964 aerial insect detection surveys approximately 40 to 50 thousand acres of Engelmann spruce, white fir, and Douglas-fir type were observed to be lightly defoliated from the north end of Payette Lake to Squaw Meadows on the Payette National Forest, Idaho. Ground evaluations in the affected area showed the defoliation to be caused by a black-headed budworm, tentatively identified as Acleris variana (Fernold).

In past years the black-headed budworm has become epidemic on many coniferous species in the western United States. Trees of all age classes have been completely killed, top killed, or have suffered a reduction in annual increment.

The present infestation is more or less sporadic and gives the appearance of a shotgun type pattern with localized hot spots. Heaviest larval concentrations occur in white fir and Douglas-fir stands with lightest concentrations being found in the Engelmann spruce type. The number of larvae per 15-inch branch sample ranged from 4 to 28.

Little is known about black-headed budworm infestations in this section of the Region as no wide-scale epidemics have developed in the past. Future examinations will be needed before the course of this infestation can be predicted.

White Fir Needle Miner

In 1963 white fir needle miner (*Epinotia meritana* Hein) populations definitely increased on the Dixie National Forest and in Bryce Canyon National Park in southern Utah. Heavy populations were found in Blubber and Skunk Creeks on the Dixie National Forest this year. An analysis of the overwintering larva numbers led to the prediction that defoliation next year will average about 50 percent, and in some localized areas, it is expected to exceed 90 percent.

Examinations of the white fir stands along the highway in Bryce Canyon National Park showed less dense populations. Defoliation damage in all areas was very low and visible only upon close examinations. Defoliation next year in Bryce Canyon National Park is expected to be very light to light.

Mites

In the past two years damage by spider mites has become very noticeable in timber stands in many parts of Region Four. In most trees all branches are infested; in some trees only the upper part of the crown shows discoloration.

Many acres of Douglas-fir on the Targhee National Forest in Idaho became infested with spider mites following the 1963 budworm control project. Mites are also present in large numbers on Douglas-fir in the 1964 spruce budworm control areas on the Salmon National Forest in Idaho. On both of these projects DDT was the insecticide. This situation is discussed in more detail in the companion report on spruce budworm infestations.

Spider mite attacks can seriously weaken and sometimes kill affected trees if the infestation persists over a period of years. Usually, however, spider mite infestations remain at a high level for two to three years and then are reduced by natural factors.

SECTION III

INSECTS AFFECTING PINYON - JUNIPER TYPE

(Insects discussed in this section)

Tussock Moths
Pitch Nodule Moth
Spittlebugs
Scale in Pinyon

Tussock Moth in Pinyon Pine

Approximately 350 to 400 pinyon pines are currently infested with a silver spotted tussock moth, Halisdota ingens Hy. Edw. on about 400 acres in Region Four. Infestations occur in South Canyon about 10 miles southwest of Panguitch, Utah, on Bureau of Land Management land; in Sowers Canyon, Ashley National Forest; and in the Hill Creek-Willow Creek Drainages on the Uintah and Ouray Indian Reservation.

There was no evidence of previous defoliation by this insect. No tree mortality has occurred as a result of defoliation, although branches defoliated last year did not refoliate and now appear dead.

In the Sowers Canyon infestation covering about 100 acres, fall evaluations showed that the size of the area increased only slightly, but the number of trees infested has approximately doubled. Defoliation is expected to increase in severity next spring when caterpillars become more active.

No fall evaluations were made of the other infestations. The number of trees and acres infested will probably increase in 1965.

Tussock Moth in Juniper

This year another silver spotted tussock moth, Halisdota argentata subalpina French, defoliated approximately 5,000 acres of juniper-pinyon type, northeast of Whiterocks, Utah, on the Uintah and Ouray Indian Reservation.

Examination this past spring showed that nearly all juniper trees and approximately 70 percent of the pinyon pine in the area were infested. Defoliation ranged from one to seventy-five percent with an average defoliation of thirty percent. Where heavy feeding has occurred on juniper, some branches are dead. Defoliation of pinyon averaged 50 to 60 percent. No limb mortality was observed in the pinyon pine.

This fall, groups of caterpillars were found actively feeding on juniper trees throughout the infested area. No caterpillars were found on pinyon pine which indicates juniper to be the favored host.

More pinyon and juniper will become infested with caterpillars next spring, with the onset of warm weather, as the caterpillars do not feed in groups in their later instars but distribute themselves widely over available host in the area. Pinyon-juniper type in this area serves as watershed and wildlife cover.

From all indications the caterpillar population now present is sufficient to cause serious defoliation of pinyon-juniper type throughout the infested area this coming year.

Unless winter mortality exceeds that expected, both the size of area infested and the severity of defoliation will increase in 1965. In all probability some juniper will likely be killed and some pinyon badly deformed.

Pitch Nodule Moth

Infestations of a pitch nodule moth, Petrova albicapitana ssp. arizonensis (Heim.) have increased in many pinyon pine stands in Region Four the past few years. The most serious infestations occur on Bureau of Land Management lands, and are located in South Canyon, Sage Hen Hollow and Dog Valley near Panguitch, Utah; on the Iron Mine Mountains in southwestern Utah; and on Penac Summit in eastern Nevada. A less serious outbreak is present on Bureau of Land Management land on the north end of the Henry Mountains in south central Utah. Infestations on National Forest lands occur in Sowers Canyon, Ashley National Forest, and in South Canyon, Dixie National Forest. Heavy populations are also present on the Noson Road Ridge in the Willow Creek Drainage, and near No Man Land in the Hill Creek Drainage on the Uintah and Ouray Indian Reservation. The total number of acres infested is not known.

The above mentioned species of Petrova is the only one we have had identified to date, but other species are probably involved because more than one type of nodule damage occurs in some of the infestations.

The infestation on Bureau of Land Management and National Forest lands southwest of Panguitch, Utah, lies within and around a Christmas tree sale area. Most of the trees within the sale area have been rendered unfit for sale as Christmas trees. Trees have been stunted; branch tips have curled, turned yellow and many have been broken off by the wind. Where infestations have persisted for three or four years, branches are badly deformed. Yellow pitch nodules can be found on nearly all branches. Old nodules remain on trees for about three years.

Fifteen-inch branch samples taken before moth flight this year showed an average of 2.2 infested nodules per sample. This was 1.7 more infested nodules per 15-inch sample than were present during 1963. Fifteen-inch branch samples taken after egg hatch showed an average of 2.4 infested nodules per sample. It now appears that the number of infested nodules will increase by more than two-fold in 1965. If this outbreak continues its present trend, it is likely that most of the pinyon pine type throughout the Panguitch area will become infested, and in time, nearly all of the suitable pinyon pine will be rendered temporarily unfit as Christmas trees. In addition, terminal destruction caused by the nodule moth destroys the cone bearing tips, which will adversely affect the pine nut crops.

Size and intensity of damage to pinyon pine in the Iron Mine Mountain and Penac Summit infestations on Bureau of Land Management land has increased

during the past two years. Yellow pitch nodules can be found on nearly all branches. Some of the branch tips have curled, turned yellow, and were broken off by wind. Mining of leaders resulted in approximately a 50 percent reduction of the pinyon nut crop in these two areas. The trend is expected to remain epidemic through next year which could result in the death of many terminals.

A pitch nodule moth infestation which has been active for the past three years in Sowers Canyon has become more serious this year. Random counts taken from 15-inch branch samples show a threefold increase in the number of nodules infested from 1963 to present 1964. Moth larvae feeding inside new nodules will cause curling and death of terminals this coming year.

No decrease in seriousness of the infestation is expected through next year.

The presence of both old and new nodules indicated the pitch nodule moth to be active in pinyon pine in the Hill and Willow Creek Drainages on the Uintah and Ouray Indian Reservation. No detailed evaluations were made of these infestations but they are likely to remain epidemic through next year.

Spittlebugs in Juniper

The number of acres of juniper infested with spittlebugs decreased from 500 in 1963 to 250 in 1964. This small outbreak is located in Bear Valley on the Dixie National Forest. The number of spittlebugs per 15-inch branch sample increased from four to approximately eight. Branch tips had turned yellow and appeared dead wherever feeding occurred. The infestation is expected to remain active through next year.

Scale in Pinyon

The number of acres infested with a scale, Matsucoccus acalyptus Herbert., decreased near Panguitch, Utah, this year. Defoliation was lighter in all areas examined except in the Five Mile Creek Drainage. However, approximately 300 acres of pinyon pine still support epidemic populations of this scale.

Examinations of the pinyon pine stands near the Wheeler Peak scenic area on the Humboldt National Forest showed that pinyon pine needle scale population was considerably less this year than it has been for the past three years. On the Humboldt National Forest and adjoining National Park lands in Nevada the scale is now endemic.

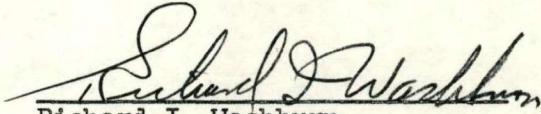
Epidemic populations of scale are still epidemic on the east side of Highland Peak near Pioche, Nevada. Unless abnormal mortality takes place the infestation should remain epidemic at least through next year.

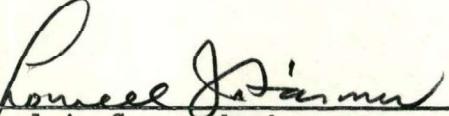
DAMAGE EVALUATION

Many different types of defoliating insects are reported in outbreaks in many centers and in a variety of hosts throughout the Forest Service Region Four.

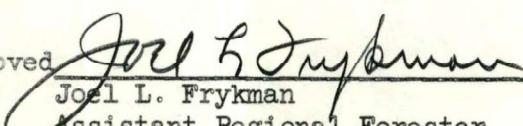
The economic effect of defoliators can be related directly to the type of damage caused and to man's reason for protecting the host plants affected. As an example, minor defoliation can render potential Christmas trees unmerchantable; whereas all damage less than outright tree mortality can be tolerated if the plants are valuable only as ground cover.

Today, however, with the multiple-use concept of land management the economic effects of defoliating insects can rarely be measured on the basis of only one use. Also, as forest land management becomes more intensive, it is increasingly necessary to require entomological evaluation of all defoliating insect outbreaks. Data from biological evaluations provide the land manager with the first facts upon which he can conduct a complete analysis of the problem and thus decide whether suppressive action is desirable and necessary.


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Defoliator Infestations

1. <u>Anacampodes clivinaria</u> (Guenee)	9. Spittlebugs on Juniper
2. Leaf tier	10. Tussock Moths
3. Mealybug <u>Puto</u> sp.	11. Sagebrush defoliator
4. White Fir Needle Miner	12. Sheep moth
5. Pitch nodule moth	13. Tube moth
6. <u>Halisidota ingens</u> Hy. Edw.	14. Lodgepole needle miner
7. <u>Halisidota argentata</u> <u>subalpine</u> French	15. Black-headed Budworm
8. Pinyon pine scale	16. Tent caterpillars

